Pion Rejection in sPHENIX

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Introduction

The goal is to calculate expected background under Upsilon peak.

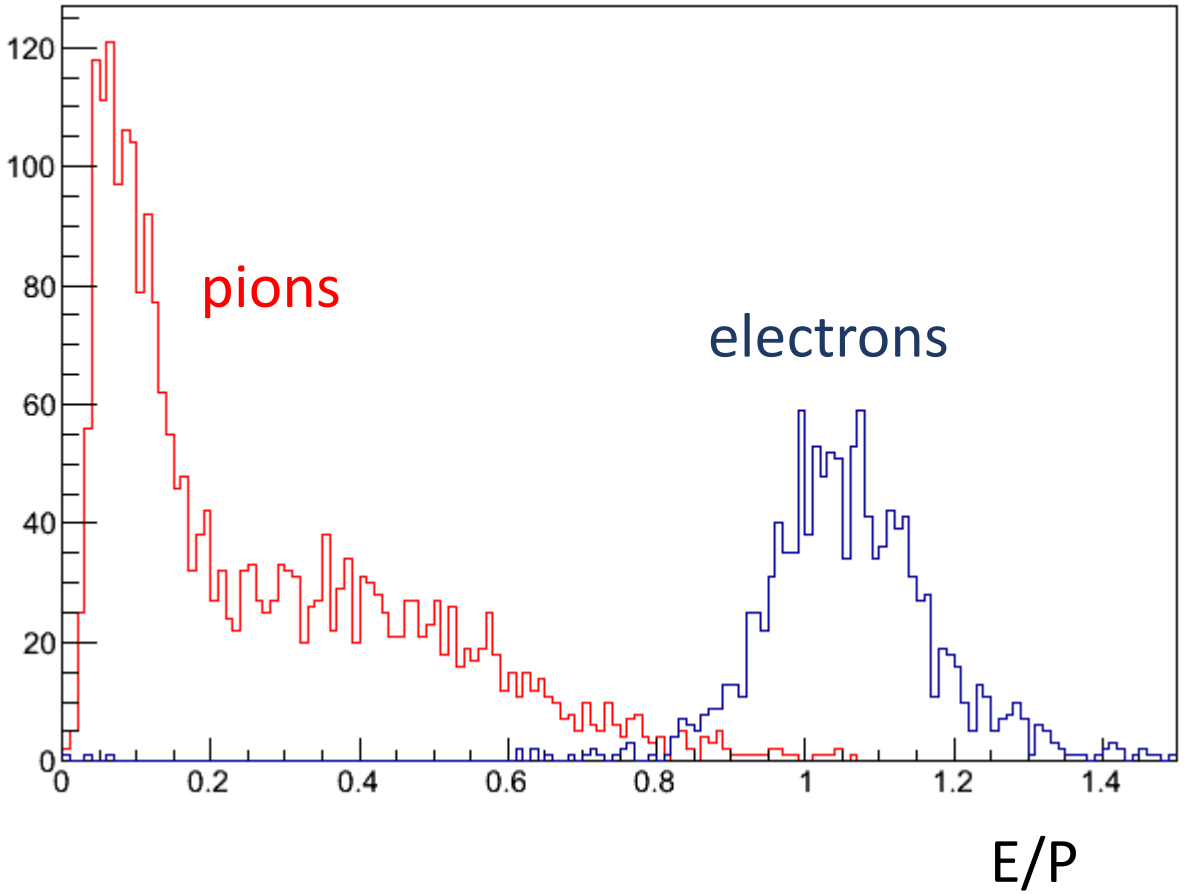
One of the main sources of the background is misidentified pions and their combinations with charm/bottom electrons.
Technical note 457 used constant pion rejection factor.

With Jin's help we set up embedding of single particles in central (0-4.4fm) Hijing events. Jin's code branch: *RefDesign-2016Rescoping-Embed*
https://github.com/blackcathj/macros/tree/RefDesign-2016Rescoping-Embed/macros/g4simulations

Reconstruction and evaluation takes about 3 min. per event.
Embedded 10k electrons and 100k pions in 1k Hijing events located in
/sphenix/sim/sim01/production/2016-07-12/sHijing/spacal2d/
Each Hijing event used 100 times.

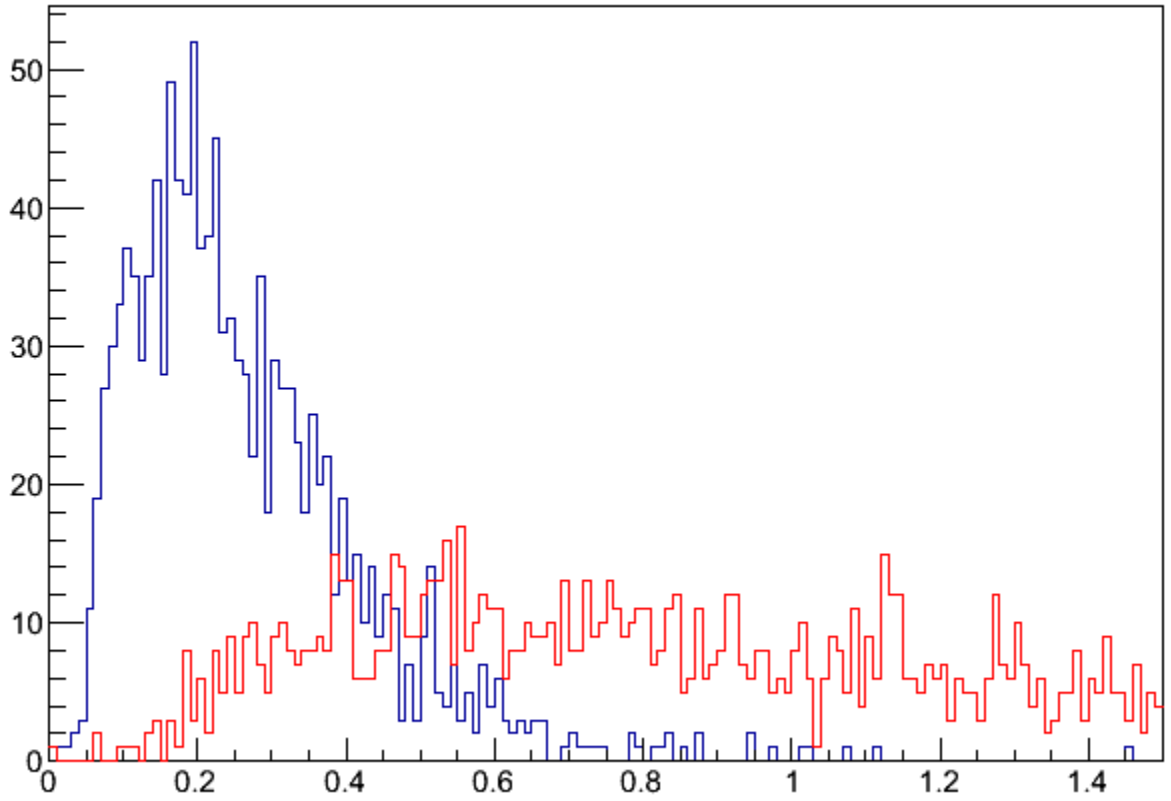
Pion rejection using E/P in CEMC

Example for $4 < p_T < 6$ GeV/c



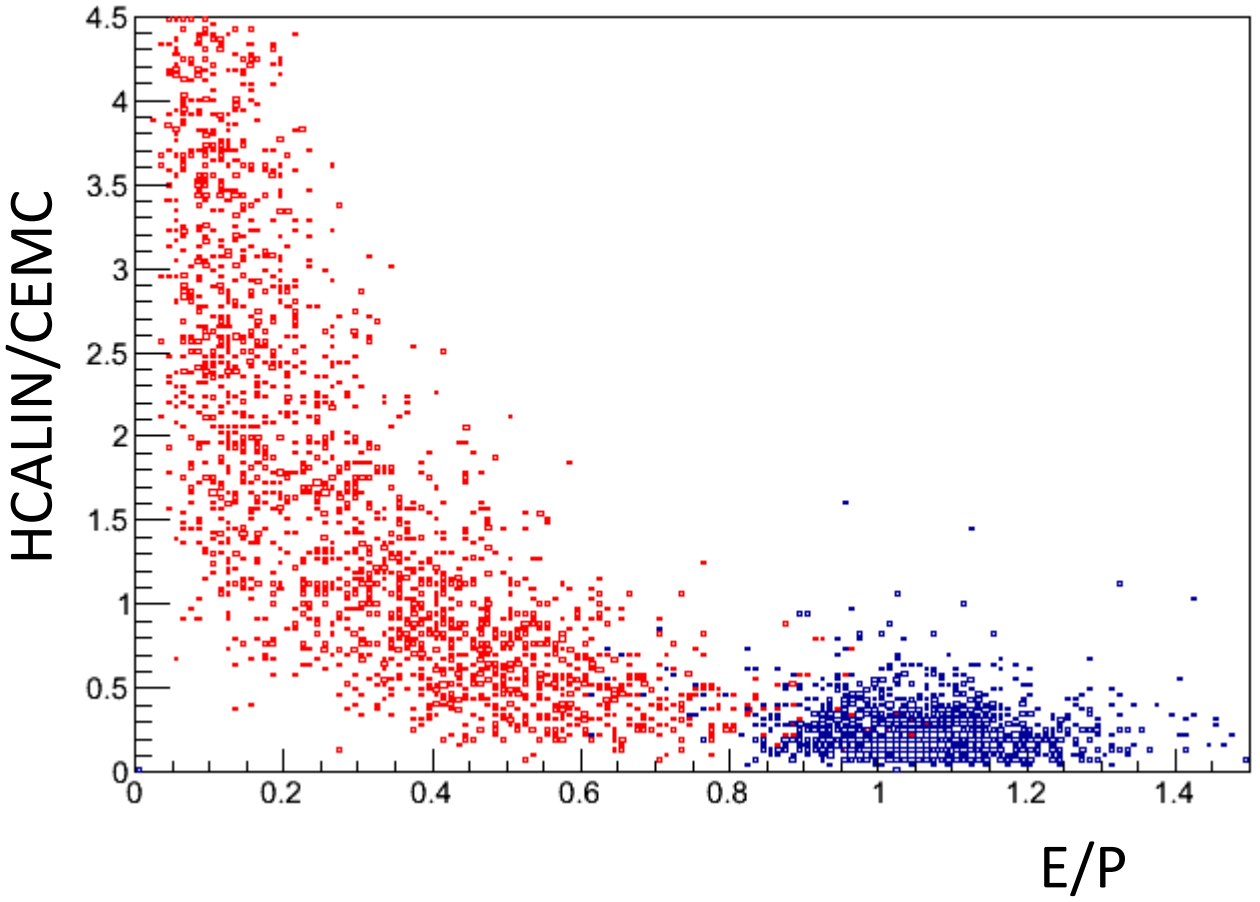
CEMC energy in 3x3 cell

Pion rejection using HCALIN / CEMC



Both CEMC and HCALIN energy in 3x3 cell

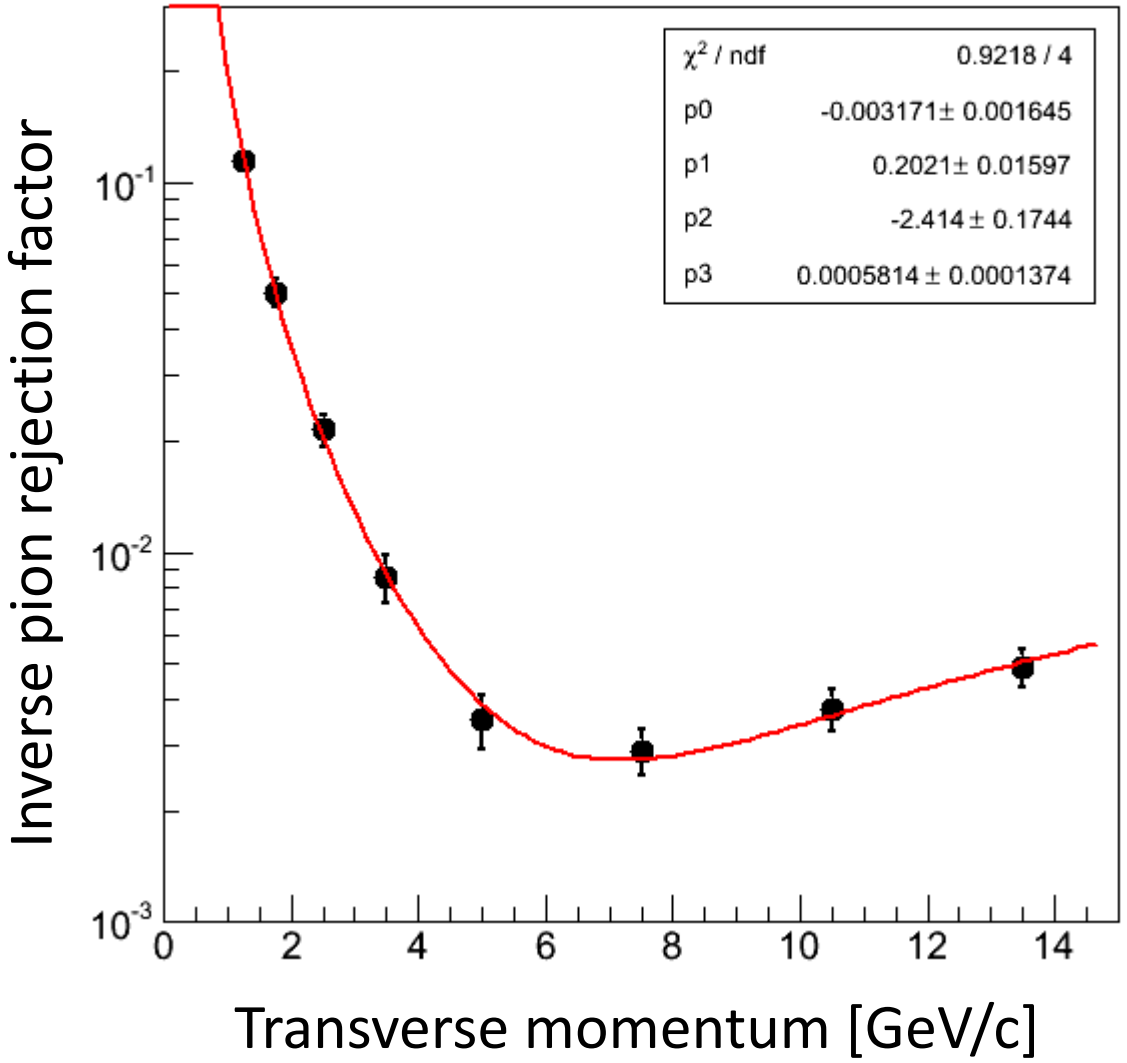
HCALIN/CEMC vs E/P in CEMC



After applying E/P cut adding HCALIN/CEMC cut does not help.

Typical 90% electron efficiency cut is E/P>0.9

Pion Rejection Factor



Fit with: [0]+[1]*pow(x,[2])+[3]*x

For electron efficiency 90%

We use track p_T cut of 2GeV, where rejection is about 50.
In the most important 5-6GeV range rejection is better than 200.

To do list

Calculate rejection for anti-protons and Kaons

Check eta dependence